4.8 GREENHOUSE GAS EMISSIONS

4.8.1 INTRODUCTION

This section presents existing conditions and analyzes the potential greenhouse gas emissions that would result from implementation of the Patterson Ranch Planned District. This section describes the regulatory framework for management of global climate change on a federal, state, regional, and local level.

For the purposes of this analysis, Scenario 1 (the construction of up to 500 single-family homes) was used because it would generate greater greenhouse gas emissions than Scenario 2 (the construction of up to 448 single-family homes and 72 apartments).

Text in reference to the excavation of soil has been removed with the incorporation of the project applicant's new mitigation measure, eliminating the borrow of 300,000 cubic yards of soil southwest of Ardenwood Boulevard, as described in **Chapter 3, Project Description**. This change is shown throughout this section in strikethrough/underline format. The greenhouse gas emissions modeling in the Recirculated Draft EIR assumed an average truck haul roundtrip length of 10 miles for the import of 300,000 cubic yards of soil to the project site. The applicant's new mitigation measure includes the import of 300,000 cubic yards of soil from an offsite location. At this time, the location from where the soil would be imported is unknown; however it is assumed that soil would be imported from a site located within a 10 mile round trip distance from the project area.

4.8.2 EXISTING CONDITIONS

Description of Greenhouse Effect

Heat retention within the atmosphere is an essential process to sustain life on earth. The natural process through which heat is retained in the troposphere[1] is called the "greenhouse effect." The greenhouse effect traps heat in the troposphere through the following three-fold process: short-wave radiation emitted by the sun is absorbed by the earth; the earth emits a portion of this energy in the form of long-

[1] The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth's surface to 10 to 12 kilometeres.

wave radiation (thermal radiation); and GHGs in the upper atmosphere absorb this long-wave radiation and emit it toward the earth. This "trapping" of the long-wave (thermal) radiation emitted back toward the earth is the underlying process of the greenhouse effect. Without the greenhouse effect, the earth's average temperature would be approximately -18 degrees Celsius (°C) (0 degrees Fahrenheit (°F) instead of its present 14 °C (57 °F)).[2]

Greenhouse Gas Emissions Background

GHGs are emitted by both natural processes and human activities. Emissions from human activities, such as electricity production, motor vehicle use, and agriculture, are elevating the concentration of GHGs in the atmosphere, and are reported to have caused a trend of unnatural warming of the earth's natural climate, known as global warming or global climate change. The primary GHGs emitted by human activities that are thought to be contributing to global climate change include the following:

- Carbon dioxide (CO_2), which is primarily a byproduct of fuel combustion;
- Nitrous oxide, which is a byproduct of fuel combustion and also associated with agricultural operations such as fertilization of crops;
- Methane, which is commonly created by off-gassing from agricultural practices (e.g., keeping livestock) and landfill operation;
- Chlorofluorocarbons (CFCs), which is widely used as refrigerants, propellants, and cleaning solvents;
- Hydrofluorocarbons (HCFCs), which is used as a substitute for chlorofluorocarbons in refrigeration and cooling; and
- Perfluorocarbons and sulfur hexafluoride, which are emissions commonly created by industries such as aluminum production and semiconductor manufacturing.

Gases in the atmosphere can contribute both directly and indirectly to the greenhouse effect. Direct effects occur when the gas itself absorbs reflected solar radiation. Indirect effects occur when gases cause chemical reactions that produce

[2] National Climatic Data Center. 2008. "Global Warming Frequently Asked Questions." Available at: <http://www.ncdc.noaa.gov/oa/climate/globalwarming.html>.

other GHGs or prolong the existence of other GHGs. A gas's potential contribution to the greenhouse effect can be measured using an indicator called the Global Warming Potential (GWP).

The GWP concept is used to compare the relative ability of each GHG to trap heat in the atmosphere. The most abundant GHG is CO_2, which is the relative measurement for all other GHGs. A unit (e.g., a ton) of CO_2 has a GWP of 1, and the same quantity of other GHGs would have a relative GWP, expressed in CO_2 equivalent units (CO_2e). For example the GWP for a unit of methane is 21 CO_2e, while nitrous oxide has a GWP of 310 CO_2e. Other trace gases, such as CFCs and HCFCs, have GWPs that are hundreds or thousands of times more powerful than CO_2. Fortunately, these gases are found at much lower concentrations and many are being phased out as a result of global efforts to reduce deterioration of stratospheric ozone.

In the United States CO_2 emissions account for about 85 percent of the CO_2e emissions, followed by methane at about 8 percent and nitrous oxide at about 5 percent.

Global Climate Change Background

The prevailing scientific opinion on global climate change is that most of the warming observed over the last half of the century can be attributed to human activities. A report of the Intergovernmental Panel on Climate Change (IPCC) - an international group of scientists and representatives - concludes "The widespread warming of the atmosphere and ocean, together with ice-mass loss, support the conclusion that it is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone."[3]

According to the IPCC report, human activities have exerted a growing influence on some of the key factors that govern climate by changing the composition of the atmosphere and by modifying vegetation. GHGs, including CO_2, are the primary causes of the human-induced component of global climate change. GHGs released by the burning of fossil fuels, agriculture, land clearing, waste decomposition, soil disruption, and the release of industrial chemicals lead to an increase in the greenhouse effect. Emissions of other GHGs, such as methane and nitrous oxide,

[3] Intergovernmental Panel on Climate Change Fourth Assessment Report: Climate Change 2007 – AR4 Synthesis Report. 2007.

have also increased due to human activities. Since the Industrial Revolution in 1750, global atmospheric concentrations of CO_2 have risen about 36 percent, due primarily to the combustion of fossil fuels.

The IPCC predicts a temperature increase of between 2.0 and 11.5 °F (1.1 to 6.4 °C) by the end of this century. This has profound implications for weather patterns, including the type, timing and location of precipitation (e.g., snowfall, monsoon rains) and the formation of destructive weather events (e.g., typhoons, hurricanes, tornados, cyclones, droughts, flooding rainfall). The IPCC report also states that the increase in hurricane and tropical cyclone strength since 1970 can likely be attributed to human-generated GHGs.

Rising temperatures also can change ecosystems resulting in increases in wildfires caused by lightning storms and fueled by dryer vegetation, species relocations or invasive species infestations, and the spread of disease, and increase in sea level rise. Global climate change may also cause civil strife (i.e., group conflict regarding finite resources) and economic uncertainty in areas of the world where rivers or lakes are drying up and harvests are ruined, resulting in human migrations to other areas with limited resources.

4.8.3 REGULATORY SETTING

Global climate change is an emerging environmental concern being raised and discussed at the international, national, statewide, and local levels. At each level, agencies are considering strategies to control emissions of gases that contribute to global climate change.

Federal Regulations

United States Environmental Protection Agency

The United States participates in the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC uses the Kyoto Protocol, established in 1992, for setting a reduction of GHG emissions. The Kyoto Protocol is intended to achieve stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system and establishes legally binding commitments for the reduction of GHG emissions. While the United States signed the Kyoto Protocol, which would have required reductions in GHGs, the U.S. Congress never ratified the protocol. Instead, the United States announced a strategy to reduce the GHG intensity of the American economy by 18

percent over the 10-year period from 2002 to 2012, primarily through the use of voluntary and incentive-based programs to reduce emissions, and through the promotion of low emission technology and better climate science.

As of March 2009, the U.S. Environmental Protection Agency (EPA) has issued a rule that requires mandatory reporting of GHG emissions from large sources in the United States. The U.S. EPA requires that suppliers of fossil fuels or industrial GHG, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions submit an annual report to the U.S. EPA.[4]

As part of the commitments to UNFCCC, the U.S. EPA inventories GHG emissions. The most recent update of the inventory evaluates the period from 1990 to 2007.[5] During this time period overall GHG emissions grew at a rate of about 0.9 percent per year, slower than the population, which grew at an annualized rate of 1.1 percent. Total U.S. emissions rose by 14.7 percent, while the United States gross domestic product increased by 59 percent over the same period, resulting in a substantial decrease in greenhouse intensity per unit of GDP. The inventory documents that the transportation sector currently emits about 33 percent of CO_2e emissions, with 60 percent of those emissions coming from personal automobile use. Residential uses, primarily from energy use, account for approximately 20 percent of CO_2e emissions. Overall, it is estimated that the United States contributes approximately 35 percent of the world's CO_2e emissions.

State Regulations

The State of California has been at the vanguard of state efforts to regulate and reduce GHG emissions and to plan for the effects on global climate change. The state recognizes that "there appears to be a close relationship between the concentration of greenhouse gases in the atmosphere and global temperatures" and that "the "evidence for climate change is overwhelming." The affects of climate change on California, in terms of how it would affect the ecosystem and economy, remain uncertain. California has many areas of concern regarding climate change with respect to global warming. According to a 2009 California Climate Adaptation

[4] U.S. EPA. Mandatory Reporting Rule for Greenhouse Gases. March 2009.

[5] U.S. EPA. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007.

Strategy final discussion report prepared by the California Climate Action Team Report,[6] the following climate change effects and conditions can be expected to occur in California over the course of the next century:

- A change in the timing of precipitation, with more falling as rain and less as snow, resulting in a diminishing Sierra snowpack that would threaten the state's water supply;
- Increased average temperatures of up to 4.0-9.0 °F;
- A 25 to 35 percent increase in the number of days ozone pollution levels are exceeded in most urban areas;
- Increased vulnerability of forests due to pest infestation, increased temperatures, and lighting storms without precipitation;
- Increased challenges for the state's important agricultural industry from water shortages, increasing temperatures, and saltwater intrusion into the Delta;
- Increased electricity demand, particularly in the hot summer months; and
- Increased sea-level rise by 12-18 inches by 2050 and by 21-55 inches by 2100 (Sea-level rise is discussed further in **Section 4.9 Hydrology and Water Quality**).

Current statewide emissions of GHG gases are estimated at 484 million metric tons CO_2e, which is about 7 percent of the emissions of the entire United States. Transportation is the largest source of GHG emissions in California, creating about 40 percent of the emissions. Electricity generation is responsible for 20 to 25 percent of statewide GHG emissions and industrial activities account for another 20 percent. On a per-person basis, GHG emissions are lower in California than most other states; however, California is a populous state, and the second largest emitter of GHG in the United States, making it one of the largest emitters in the world. Under a "business as usual" scenario (i.e., with no new reduction plans), emissions of GHG in California are estimated to increase to approximately 600 metric tons of CO_2e by 2020, a 44 percent increase over current emissions.

[6] The "Climate Action Team", a group of state agencies, was set up to implement Executive Order S-3-05. Under this order, the state plans to reduce GHG emissions by 80 percent below 1990 levels by 2050.

State of California Executive Order S-20-04 – The California Green Building Initiative

In December 2004, the Governor of California signed Executive Order S-20-04, which established California's priority for energy and resource-efficient high performance buildings. Executive Order S-20-04 sets a goal of reducing energy use in private commercial and state-owned buildings by 20 percent in 2015, using the nonresidential elements of Title 20 and Title 24 from 2003 as the baseline. Private commercial buildings are also encouraged to be retrofitted, constructed, and operated in compliance with the state's Green Building Action Plan.[7]

State of California Executive Order S-3-05

In June 2005, the Governor of California signed Executive Order S-3-05 which identified the California Environmental Protection Agency (Cal/EPA) as the lead coordinating state agency for establishing climate change emission reduction targets in California. The "Climate Action Team", a group of state agencies, was set up to implement Executive Order S-3-05. Under this order, the state plans to reduce GHG emissions by 80 percent below 1990 levels by 2050. Specifically, the order includes the following benchmarks:

- By 2010, reduce statewide GHG emissions to year 2000 levels;
- By 2020, reduce statewide GHG emissions to 1990 levels; and
- By 2050, reduce statewide GHG emissions to 80 percent below 1990 levels.

State of California Executive Order S-14-08

In November 2008, the Governor of California signed Executive Order S-14-08 which raises California's renewable energy goals to 33 percent by 2020. It also simplifies the licensing process for renewable energy projects.

State of California Executive Order S-21-09

In September 2009, the Governor of California signed Executive Order S-21-09 which reiterates the goals established in Execute Order S-14-08. It allows the

[7] The California Green Building Action Plan established the Green Action Team to oversee and direct progress toward the goals of the Governor's Green Building Executive Order S-20-04. The Green Building Action Plan describes the actions that support the Executive Order including recommendations for any additional actions, mandates, or legislation that may be warranted to reduce grid-based energy purchases.

California Air Resources Board (CARB) to work with State energy agencies to adopt regulations necessary to implement the 33 percent increase in renewable energy by 2020 goal.

Assembly Bill 32 — The California Global Warming Solutions Act of 2006

In 2006, the Governor of California signed into law Assembly Bill (AB) 32, the Global Warming Solutions Act. The Act requires that California cap its GHG emissions at 1990 levels by 2020. This legislation requires CARB to establish a program for statewide GHG emissions reporting, and monitoring/enforcement of that program. CARB recently published a list of discrete GHG emission reduction measures that can be implemented immediately (the Early Action Plan). CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions. CARB's Early Action Plan identifies regulations and measures that could be implemented in the near future to reduce GHG emissions. CARB has estimated the 1990 statewide emissions level to be 427 metric tons of CO_2e. Meeting the reduction targets of AB32 will therefore requiring a reduction of almost 30 percent of the business-as-usual emissions anticipated in 2020.

Passenger vehicle emissions are a major source of GHG emissions that CARB has identified for emission reduction. AB 1493, the Pavley Bill, directed CARB to adopt regulations to reduce emissions from new passenger vehicles by increasing vehicle efficiency and developing a low carbon fuel standard (LCFS) to reduce the emissions intensity of automobile fuel. Current projections indicate even with these measures enacted, California will still fall short of the 1990 level targets for transportation emission reductions. Under the Bush Administration, the U.S. EPA blocked California's efforts to implement an LCFS, however, the Obama Administration has directed the U.S. EPA to reconsider its action. Nonetheless, the earlier U.S. EPA action and pending legal challenges by the automotive industry could continue to delay California's efforts to achieve emission reduction targets.

CARB is also targeting other sources of emissions. The main measures to reduce GHG emissions are contained in the AB32 Scoping Plan, which was adopted by CARB in December 2008. This scoping plan includes a range of GHG reduction actions, separated by emissions sector (transportation, industry, energy generation, forestry, etc.). Central to the draft plan is a cap and trade program,[8] currently under

[8] A "cap and trade program" is commonly referred to as an emissions trading program. The program is an administrative approach used to control pollution by providing economic incentives for achieving reductions in pollutant emissions. A governing authority sets a limit, or cap, on the total emissions

development, that would assign emissions credits to cover large portions of the state's GHG emissions. This program is being developed in conjunction with the Western Climate Initiative, comprised of seven states and three Canadian provinces, to create a regional carbon market. The Scoping Plan also proposes that utilities produce a third of their energy from renewable sources such as wind, solar and geothermal, and proposes to expand and strengthen existing energy efficiency programs and building and appliance standards. The regulatory process to implement the plan begins in 2009. Details of the program's administration, such as regulation of emissions and development of targeted emissions fees, will be created during the regulatory process. By law, implementation measures must be enacted by 2012.

Modification to the Public Resources Code (Senate Bill 97)

Pursuant to State Senate Bill (SB) 97, the Governor's Office of Planning and Research (OPR) was required to "prepare, develop, and transmit" the guidelines to the Resources Agency on or before July 1, 2009. OPR transmitted draft guidelines to the Resources Agency in June 2009. In September, 2009, the Resources Agency released draft amendments to the CEQA Guidelines regarding GHG reductions. These draft guidelines were adopted on December 30, 2009 and went into effect on March 18, 2010. These CEQA Guidelines provide direction for determining the significance of impacts from GHG emissions on the environment.

The Bay Area Air Quality Management District (BAAQMD) released draft Air Quality Guidelines in Fall 2009 and updated May 3, 2010 that include a significance threshold for GHG emissions within the Bay Area region.[9] These guidelines were adopted by the BAAQMD Board on June 2, 2010. Refer to **Section 4.8.3, Impacts and Mitigation Measures**, for further discussion of the significance thresholds used in evaluating global climate change and GHG emissions for this project.

California's Energy Efficiency Standards for Residential Buildings, Title 24, Part 6, of the California Code of Regulations and California Building Code (Cal Green)

The Energy Efficiency Standards for Residential Buildings were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The

permitted for a particular pollutant. Other agencies or companies are issued emission permits and are required to hold an equivalent number of allowances, allowing for the right to emit a set amount of emissions. Agencies or companies requiring an increase in emissions beyond their cap are able to trade allowances to agencies or companies not using their total allotments, or caps.

[9] Bay Area Air Quality Management District (BAAQMD). 2009. "Draft Air Quality Guidelines."

standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The 2008 Standards went into effect in January 2010. Typically every three years energy efficiency standards are revised and performance requirements are more stringent. It is expected at least one more update would occur prior to the development of the project. Projects that apply for a building permit on or after this date must comply with the 2008 Standards. In addition, new minimum green building requirements are included in the most recent California Building Code update and they will be in effect by January 2011.

California's Regional Transportation and Land Use Planning Efforts (Senate Bill 375)

California enacted legislation Senate Bill 375 (SB 375) to attempt to reduce GHG emissions by modifying land use practices. SB 375 will result in the development of regional emission reduction goals that regions must apply in preparing their Regional Transportation Plans. Each Metropolitan Planning Organization (MPO; the transportation planning organization for the region) must prepare a Sustainable Community Strategy (SCS), which is designed to reduce GHG emissions as much as feasibly possible. If the SCS does not meet the target for GHG emissions, another plan, called an Alternative Planning Strategy, must be prepared. All future transportation funding must be consistent with the SCS. The legislation also allows developers to bypass certain environmental reviews under CEQA if they build projects consistent with the new sustainable community strategies. SB 375 directs CARB to develop regional GHG emission reduction targets to be achieved from the transportation sector for 2020 and 2035. CARB will work with the MPOs and regional planning agencies (ABAG and MTC in the Bay Area) to align their regional transportation, housing and land use plans to reduce vehicle miles traveled and attain its GHG reduction targets. However, the regional targets for reductions in GHG emissions have not yet been adopted by CARB.

California Climate Action Registry (Senate Bills 1771 and 527)

Established in 2001 by Senate Bills 1771 and 527, the California Climate Action Registry (CCAR) serves as a nonprofit voluntary registry for GHG emissions. The CCAR has developed a general reporting protocol and industry-specific protocols to provide guidance on the inventory of GHG emissions, which allows organizations to establish GHG emission baselines against which any future GHG emissions reduction requirements may be applied.

California's Renewable Energy Portfolio Standard Program (Senate Bills 107 and 1078)

The State of California established its Renewable Energy Portfolio Standard Program under Senate Bill 1078 (SB 1078) in 2002, which originally included a goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent by 2017. Senate Bill 107 (SB 107) requires investor-owned utilities, such as PG&E, to meet the 20 percent renewable energy goal by 2010. As of 2005, the most recent Energy Action Plan in the state raised the renewable energy goal to 33 percent by 2020.

Project Consistency

The project would be required to comply with any state regulations pertaining to GHG emissions. It is the goal of the state (AB 32) to reduce GHG emissions to previous levels (i.e., 1990 levels by 2020). As discussed in **Chapter 3, Project Description**, the project would incorporate 'green building' and energy saving measures for building and cooling that would help reduce GHG emissions and subsequent global climate change. The project includes a commitment to 100 points on the Build It Green Checklist, which has a mandatory 15 percent additional energy efficiency requirement, Bay Friendly Landscaping, tankless water heaters and prewiring of solar photovoltaic systems with the option for buyers to include complete systems at the time of construction. The project would also incorporate trees for landscaping and would donate ~~316~~ 308 acres of open space to public agencies for preservation, as well as 8 acres to Fremont for parkland dedication land.

The project would also be located on two bus routes and near a park & ride parking lot, and would develop bus stops and pedestrian and bike paths within the project area, as well as a connection to the Alameda Creek Regional Trail.

Local Regulations

City of Fremont

Fremont has established a goal for the upcoming Climate Action Plan to reduce GHG emissions by 25 percent below 2005 levels by the year 2020. This target was selected to be consistent with surrounding jurisdictions and with AB 32. Fremont is currently updating their General Plan, and also developing a Climate Action Plan that will include modified emissions targets more specific to the City.

Fremont has already taken steps to reduce government GHG emissions. The City has adopted a Sustainable Building and Landscaping policy that requires new City buildings over 10,000 square feet to obtain a Leadership in Energy and Environmental Design (LEED) Silver certification. The City also requires Bay Friendly landscaping practices and applies green building design standards to residential planned districts.

In November 2007, Fremont partnered with ICLEI (an international association of local governments as well as national and regional government organizations that have made a commitment to sustainable development) to quantify emissions from City facilities and vehicles. The inventory found that Fremont emitted approximately 1,862,221 tons CO_2e from the residential, commercial, industrial, transportation, and waste sectors in 2005. The per capita rate in 2005 was approximately 8.86 tons CO_2e per person citywide. Overall, vehicle travel accounted for 60 percent of the 2005 emissions, but about 40 percent of the CO_2e emissions were from motor vehicles driven on state highways in Fremont (e.g. I 880, SR 84). The City has no control over these trips, most of which have origins and destinations outside of Fremont. Of the remaining 1,124,781 tons of CO_2e generated by activities in the Fremont, about 34 percent were from travel on local roads, 35 percent from commercial and industrial activities, 25 percent from residential energy use, and 3 percent from solid waste.

Project Consistency

Anticipated GHG emissions associated with the project were not included in Fremont's 2005 GHG inventory. Therefore, GHG emissions associated with the project have not been factored into the existing GHG inventory and would present additional emissions beyond what had previously been measured. However, Fremont does not inventory project-specific changes resulting in either reductions or increases since the 2005 inventory because it plans to use growth projections for the year 2020 in evaluating the upcoming Climate Action Plan. The individual project analysis that follows demonstrates that the projected per capita average emissions of the project would be lower than the citywide average rate.

4.8.4 IMPACTS AND MITIGATION MEASURES

Significance Criteria

Appendix G of the CEQA Guidelines identifies issues to be considered when determining whether a project could have significant effects on the environment. The project would have a significant greenhouse house emissions impact if it would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gasses.

The BAAQMD released draft thresholds of significance in Fall 2009 and modified them in May 2010. They were adopted by the BAAQMD Board on June 2, 2010. The City of Fremont has chosen to apply the individual project performance level threshold identified in the BAAQMD guidelines to the proposed project. Since the project is predominantly residential,[10] the following threshold is used in this analysis:

- 4.6 metric tons of CO_2e /capita/yr

This ~~Recirculated Draft~~Final EIR provides a discussion of the impacts of the project with respect to global climate change. It discusses the emissions in comparison with the BAAQMD CEQA Guidelines. The project's operational and construction GHG emissions are quantified on CO_2e basis and compared against the threshold noted above. Additionally, the project evaluation analyzes whether it would impede or conflict with the emissions reduction targets strategies prescribed in or developed to implement AB 32.

Methodology

Scenario 1 was used in this section to analyze greenhouse gas emissions because it provides a more conservative estimate (i.e., higher emissions per capita) than Scenario 2. Emissions associated with project construction and operation were calculated in accordance with the California Air Pollution Control Officers Association (CAPCOA) guidance for calculating project emissions. As recommended by the CAPCOA approach, area (natural gas combustion) and mobile source (vehicle)

[10] The residential threshold was selected because the primary use on the site would be residential uses. The project would not have a large day time or service population which would apply to commercial or office-type projects.

emissions were calculated using the URBEMIS2007 model. The URBEMIS2007 model was used to compute annual CO_2 emissions from the project. The methodology used for this modeling is described in **Section 4.3, Air Quality.**

The URBEMIS2007 model, however, does not predict indirect emissions associated with electricity consumed in the project area that is generated off-site. For the purposes of this analysis, such emissions were based on residential electricity consumption rates developed by a statewide residential saturation study prepared for the California Energy Commission (CEC). According to the CEC report, new single-family residences consume 8,117 kilowatts annually and new multi-family residences consume 3,451 kilowatts annually.

Electricity-related GHG emission rates reported by PG&E were used. PG&E's reports a CO_2 emission rate for electricity use in California at 456 pounds per megawatt-hour or 0.456 pounds per kilowatt-hour.[11]

This evaluation predicts emissions of CO_2. Although there are emissions of methane and nitrous oxide, which are more potent GHGs, these emissions are very small compared to CO_2 (i.e., less than 3 percent equivalent CO_2). Throughout the Bay Area, BAAQMD reports that CO_2 represents almost 92 percent of the total CO_2e emissions.[12] When broken down by sectors, the inventory reports that CO_2 makes up 98 percent mobile CO_2e emissions and over 99 percent of CO_2e electricity and natural gas emissions. As a result, the emissions of other GHG constituents associated with the project were not calculated.

It is anticipated that the project area would be developed through a phased process by multiple builders over a 15-year timeframe depending on market conditions. This timeframe assumes full occupancy of the proposed residential units and religious facilities. However, to present a conservative estimate of GHG emissions (since they are expected to decline over time as vehicles become more efficient), this evaluation assumes that construction would occur within an estimated five-year timeframe, with excavation, mass grading activities, and underground installation/surface improvements occurring primarily in the first year and building and architectural coating activities occurring over the succeeding four years. The URBEMIS2007 model assumptions for the construction and operational emissions methodology are presented in **Appendix C**, along with GHG emission calculations for electricity usage.

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[11] CARB, CCAR, ICLEI. 2008. Local Government Operations Protocol for the quantification and reporting of Greenhouse Gas Emissions, Version 1.0 - Sept. 2008.

[12] BAAQMD. 2010. Source Inventory of Bay Area Greenhouse Gas Emissions – Base Year 2007. Updated in February.

Project Impacts

Impact GHG-1: The project would potentially result in a substantial net increase in greenhouse gas emissions, resulting in a cumulative impact on global climate change. (Significant)

CO_2 is the primary GHG which would be emitted from this type of project. As previously stated, long-term operation of the project would generate GHG emissions from area and mobile sources, as well as indirect emissions from stationary sources that produce the electricity to be consumed by operation of the new development on the project area. Specifically, operational GHG emissions would result from project-generated vehicular traffic, onsite combustion of natural gas, use of consumer products, application of architectural coatings, and off-site generation of electrical power over the life of the project. Although there would also be minor emissions of methane and nitrous oxide, which are more potent GHGs, their overall effects would be very small compared to the CO_2 produced (i.e., less than 3 percent CO_2e). **Table 4.8-1, Annual CO_2 Emissions Associated with Project Operation (Scenario 1)** shows Scenario 1's estimated annual CO_2 emissions in tons per year during project operation. The URBEMIS2007 model output calculations for project operation GHG emissions are included as **Appendix C**.

Table 4.8-1 Annual CO_2 Emissions Associated with Project Operation (Scenario 1)

Source Type	Basis for Calculation	Proposed Project Annual Emissions (tons per year)	Proposed Project Annual Emissions (metric tons per year)[d]
Area Source[a]	Natural gas and landscape equipment from URBEMIS2007	1,537[a]	1,395
Mobile Sources	Traffic from URBEMIS2007	7,347[b]	6,665
Electricity Usage	Estimated single-family residential units using 8,117 kW per year and religious facilities using 16.75 kW per year per square foot.	1,146	1,040
Total[c]		**10,030**	**9,099**

a Assumes 100 percent of new residences would use natural gas for heating.

b Does not include the URBEMIS2007 predicted 5 percent reduction due to alternatives transportation options and other project features that reduce trips and vehicles miles traveled.

c No Adjustments for Project Features or Scoping Plan Measures. This is likely a conservative estimate as, prior to project construction, AB 32 will require GHG emission reductions in all sectors. Transportation emission rates will likely decrease due to increased fuel efficiency and lower carbon content in fuels, which is not adequately reflected in the URBEMIS2007 model used for this analysis. Additionally project green building and energy efficiency measures are also conservatively not factored into the projection. Therefore, actual project CO_2 emissions will likely be less.

d Metric tons are equal to 0.9072 U.S. tons

Source: Illingworth & Rodkin, 2010.

Emissions reported in **Table 4.8-1** do not include reductions from project features that would reduce vehicle travel. These features primarily include integrated sidewalks and bike lanes, and existing transit serving the project area. The URBEMIS2007 model indicates that these features could reduce CO_2 emissions by about 5 percent. To be consistent with the "worst case" traffic projections, these reductions were not applied. The results of the modeling predict that the proposed project will emit approximately 9,099 metric tons of CO_2 annually when fully developed. Area and indirect or electricity usage emissions account for about 27 percent of the project's GHG emissions. Project features that improve energy efficiency that would reduce these emissions are not included in these calculations.

About 1,500 new residents would be associated with Scenario 1 of the proposed project, so the per capita CO_2 emissions are estimated at 6.07 metric tons per person per year. These emissions would exceed the per capita threshold of 4.6 metric tons of CO_2e per year.

Construction activities in the project area would produce combustion emissions from various sources, such as site grading, ~~excavation of soils,~~ equipment engines, heavy-duty construction vehicles, equipment hauling materials to and from the project site, asphalt paving, and motor vehicles used by the construction workers. Project area construction activities would vary depending on the level of construction activity. The project would require grading, as well as the placement of fill in the project area. **Table 4.8-2, Annual CO_2 Emissions Associated with Project Construction** shows the project's estimated annual CO_2 emissions in tons per year during project construction. Based on the UBEMIS2007 model for the project, it is estimated that temporary construction emissions would average approximately 1,720 metric tons of CO_2 per year during the construction period, for a total of 8,601 metric tons of CO_2 for the entire construction phase. The BAAQMD does not identify emission based thresholds for construction activities. Individually, the construction component of the emissions would not be significant as it is a temporary action that is part of the project, is roughly 19 percent of the annualized project emissions and is part of an independently regulated industry type. The URBEMIS2007 model output calculations for project construction GHG emissions are included as **Appendix C**.

As identified above, according to the BAAQMD guidelines for determining thresholds of significance, the project would generate emissions above the 4.6 metric tons per capita per year threshold. The guidelines were based on extensive data regarding the limitations on emissions required in new development to achieve the goals established for reductions in GHGs. Since this project is estimated to generate 6.07 metric tons of CO_2 per capita per year, the emissions are above the

threshold of significance. The estimate does not account for project features that help reduce the generation of GHG emissions, such as integrated sidewalks and bike lanes, trail links to the regional Alameda Creek and Bay Trail, and existing transit serving the project including the Ardenwood Park-n-Ride lot near the project area. These features will help reduce vehicle trips and resulting carbon emissions.

Table 4.8-2 Annual CO_2 Emissions Associated with Project Construction

Year	Anticipated Construction Activity	Proposed Project Annual Emissions (metric tons per year)
1	Grading, trenching, paving	1,905
2	Building Construction	1,430
3	Building/Coating	1,397
4	Building/Coating	1,960
5	Building/Coating	1,909
Annual Average		1,720
Total Metric Tons		8,601

Notes: No reductions were taken for project features related to green building measures, e.g., materials and coatings content.

Source: Illingworth & Rodkin, 2010.

The project includes the incorporation of green building techniques to reduce project energy use. These green building techniques are not accounted for in the 6.07 metric tons CO_2 per capita per year, but would reduce the generation of GHG emissions generated by the project. Construction of the residential and institutional buildings in the project area would incorporate regional green building practices per the most current "Build It Green" checklist, and Bay Friendly Landscape Standards. The proposed development agreement would require all residential buildings to be constructed to a minimum of 100 points per the GreenPoint Checklist or of an acceptable equivalent as deemed acceptable by the City of Fremont. The project would also apply for verification through the Green Point Rater program. In addition to these green building practices, all single-family homes would be pre-wired and pre-plumbed and structurally designed for tankless water heaters and solar (photovoltaic) panels. Home buyers would be given the opportunity to have solar panels installed during construction.

Other green building features that would be incorporated as part of the project are listed below.

- Project landscaping would include water-efficient native and adaptive plants in combination with high-efficiency irrigation equipment.
- Recycled content would be included in project building materials, including the use of pre-consumer fly-ash[13] in the concrete for project walkways, driveways, roadways, and non-plant landscape elements.
- To protect regional and indoor air quality, interior paints, carpets, adhesives, sealants, and coatings selected for the project would have a low concentration of volatile organic chemicals (VOCs).
- The heating, ventilation, and air conditions (HVAC) systems within each single family home would use environmentally responsible refrigerants (i.e. non CFC-based refrigerants).[14]
- Indoor ventilation systems in each home would include high-efficiency systems to provide enhanced indoor air quality as potential pollutants would be ventilated through the building at a faster rate.
- The project would install high efficiency restroom fixtures including low-flow or dual flush toilets to reduce potable water use.
- The project would incorporate renewable energy systems, such as pre-plumbing for tankless hot water heating and the installation of photovoltaic panels.
- Wood from sustainably harvested forests (as certified by the Forest Stewardship Council) would be used in wood materials for the single family homes, including flooring, cabinets, trim, shelving, doors, and countertops.
- The project would install water and energy efficient appliances and lighting fixtures, including *EnergyStar* dishwashing and refrigeration equipment.

Incorporation of these green building techniques would reduce total CO_2 emissions to 8,237 metric tons and 5.5 metric ton CO_2 per capita per year. These calculations can be found in **Appendix C.** Nonetheless, the project would continue to exceed the 4.6 metric ton CO_2e per capita per year BAAQMD threshold.

[13] Fly ash is a residue generated during the combustion of coal and can be recycled, specifically for the use of supplementing concrete production.

[14] CFC-based (chlorofluorocarbon) refrigerants contain molecules that are associated with high global warming potential (as measured in CO_2e) and with a high ozone depletion factor.

Mitigation Measure GHG -1: Incorporation of additional green building measures.

BAAQMD provides techniques which would further reduce greenhouse gas emissions. Many of these techniques have already been incorporated into the project. The following additional BAAQMD mitigation measures shall be applied to the project to reduce CO_2 emissions:

- Plant shade trees within 40 feet of the south side or within 60 feet of the west side of properties (see **Mitigation Measure AQ-1a**);
- Require smart meters and programmable thermostats in residential and religious facilities; ~~and~~
- Require installation of recycled water and/or greywater ~~graywater~~ use (see **Mitigation Measure PU-3b**); and~~.~~
- Require installation of energy-efficient ceiling/whole-house fans (see **Mitigation Measure AQ-1a**).

Significance after Mitigation: Significant and Unavoidable

Although the project would incorporate green building measures to reduce greenhouse gas emissions, consistent with AB32, the project would continue to exceed the 4.6 metric ton CO_2e per capita per year BAAQMD threshold. Planting shade trees could reduce CO_2 generated by electricity usage by up to 30 percent and smart meters and programmable thermostats could reduce CO_2 generated by areas sources by up to 10 percent and CO_2 generated by electricity usage by up to 10 percent. Installation of recycled water and/or greywater use could reduce electricity used to convey water to residences. If 50 percent of water use is greywater or rainwater, CO_2 generated by electricity usage for water conveyance could be reduced by up to 37.5 percent. Ceiling/whole-house fans are 50 percent more efficient than conventional fans and would further reduce CO_2 generated by electricity usage. These reductions would not be substantial enough to reduce CO_2 emissions to below the 4.6 metric ton CO_2e per capita BAAQMD threshold. Given this, the project would result in a significant and unavoidable impact.

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